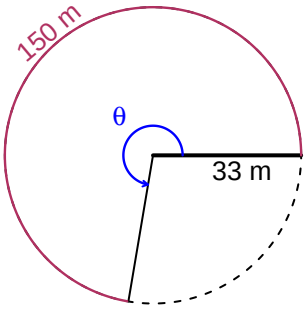
Name: Date:

Trig Final (Solution v37)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 33 meters. The arc length is 150 meters. What is the angle measure in radians?

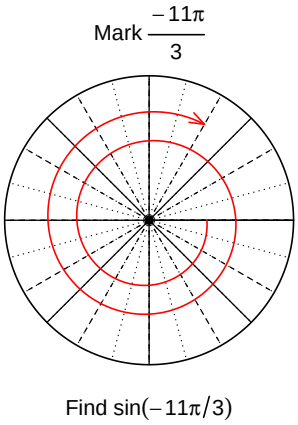


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

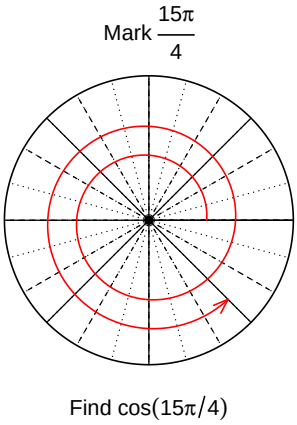
$\theta = 4.545$ radians.

Question 2

Consider angles $\frac{-11\pi}{3}$ and $\frac{15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-11\pi}{3}\right)$ and $\cos\left(\frac{15\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-11\pi/3)$



Find $\cos(15\pi/4)$

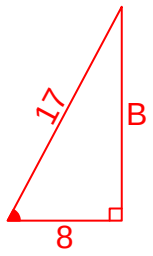
$\sin(-11\pi/3) = \frac{\sqrt{3}}{2}$

$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{8}{17}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

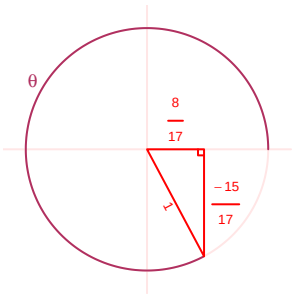
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$8^2 + B^2 = 17^2$$
$$B = \sqrt{17^2 - 8^2}$$
$$B = 15$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-15}{17}}{\frac{8}{17}} = \frac{-15}{8}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -7.14$ meters, a frequency of 2.65 Hz, and an amplitude of 3.91 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.91\sin(2\pi 2.65t) - 7.14$$

or

$$y = -3.91\sin(5.3\pi t) - 7.14$$

or

$$y = -3.91\sin(16.65t) - 7.14$$